

EXHIBIT E

Radio Frequency Analysis Report

CT2327
1063 Boston Post Road, Milford, CT 06460



August 21, 2020

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1. Overview

This RF Report has been prepared on behalf of New Cingular Wireless PCS, LLC ("AT&T") in support of the pending application for a new wireless telecommunications facility at 1063 Boston Post Road in the City of Milford, Connecticut. The proposed facility is needed to fill a coverage gap that will be created in AT&T's network within the City of Milford upon the removal of AT&T's existing wireless facility at the Howard Johnson Lodge at 1052 Boston Post Road (CT2216). The permanent facility will also provide prioritized, preemptive wireless services for first responders.

AT&T proposes to install a permanent wireless facility on a new monopole at centerline elevation of 100' above ground level ("AGL"). The proposed location has been selected as suitable to address a substantial gap in 4G LTE coverage for AT&T's network in the area when the facility at the hotel is decommissioned.

This report concludes that the proposed site will serve as an adequate replacement to the coverage and capacity that will be lost in Milford when AT&T's existing facility located at the Howard Johnson Lodge at 1052 Boston Post Road is decommissioned. The areas at risk of becoming gaps in service include Boston Post Road (US Hwy 1), New Haven Avenue and the surrounding business/retail areas in the proximity of the existing and proposed replacement site.

Included as Attachments in this report are coverage maps detailing the existing network and expected coverage from the proposed facility, pertinent site information, a terrain map, and a network layout map.

2. Technology Advances & Design Evolution

AT&T provides digital voice and data services using 3rd Generation (3G) UMTS technology in the 800 MHz and 1900 MHz frequency band, and advanced 4th Generation (4G) services over LTE technology in the 700 MHz and 1900 MHz frequency bands as allocated by the FCC. These data networks are used by mobile devices for fast web browsing, media streaming, and other applications that require broadband connections. The mobile devices that benefit from these advanced data networks are not limited to basic handheld phones, but also include devices such as smartphones, PDA's, tablets, and laptop air-cards. 4G LTE services and devices have enabled AT&T customers to have even faster connections to people, information, and entertainment.

AT&T will also deploy FirstNet services from this facility. FirstNet is a federal agency with a mandate to create a nationwide, interoperable public safety broadband network for first responders. First responders across the country currently rely on more than 10,000 separate radio networks which oftentimes do not interoperate with one another. By deploying a nationwide broadband public safety network built specifically to meet the communications needs of first responders, the FirstNet network will provide a solution to the decades-long interoperability and communications challenges first responders have experienced, and which was highlighted by the 9/11 Commission's 2004 Final Report.

FirstNet selected AT&T to build, manage and operate the National Public Safety Broadband Network ("NPSBN") using FirstNet's Band 14 spectrum (Call Sign WQQE234, 20 MHz of the 700 MHz spectrum), together with AT&T's own wireless network. Using a combination of new and existing wireless facilities, AT&T provides prioritized, preemptive wireless services for first responders across Connecticut, New England and nationwide, while also improving 4G LTE coverage for AT&T customers.

It is important to note that with AT&T's migration from 3G to 4G services come changes in the base station infrastructure and resultant changes in the operating thresholds required by the LTE network. In the past, AT&T has presented receive signal thresholds of -74 dBm for their in-building coverage threshold and -82 dBm for their in-vehicle coverage threshold. Those thresholds were based on network requirements to support 2G/3G data speeds and past usage demand. Today, customers expect low latency and faster data speeds as evidenced by increasing data usage trends and customer demand.

AT&T's 4G LTE technology is designed to thresholds of -83 dBm and -93 dBm for their 700 MHz LTE and -86 dBm and -96 dBm for their 1900 MHz LTE.¹ The stronger thresholds (-83 dBm and -86 dBm) yield greater throughputs and improved customer experience. The -93 dBm and -96 dBm thresholds are the minimum acceptable levels required to meet customer expectations for 4G service.

3. Coverage & Capacity Objectives

The decommissioning of CT2216 would significantly increase the coverage deficiency in the existing AT&T wireless communications network in the city of Milford, CT. This coverage deficiency includes but is not limited to the following:

- Boston Post Road (US Highway 1);
- New Haven Avenue;
- Cherry Street;
- The surrounding residential neighborhoods in the vicinity of the roads and areas described above.

The area of lost coverage described above is referred to herein as the "targeted area".

A substantial hardship will result with the decommissioning of AT&T's site CT2216, removing coverage and service to residents and commuters in Milford. The purpose of the proposed facility is to provide a permanent, remedial solution for the subject area.

Due to terrain characteristics and the distance between the targeted coverage area and the existing sites, AT&T's options to provide services in this area are quite limited (maps of the terrain in this area and the distance to neighboring AT&T sites from the proposed site are included as Attachments 1 & 3). AT&T's network requires deployment of antennas throughout the area to be covered. These antennas are connected to receivers and transmitters that operate in a limited geographic area known as a "cell." AT&T's wireless network, including their wireless handsets and devices, operate by transmitting and receiving low power radio frequency signals to and from these cell sites. The signals are transferred to and from the landline telephone network and routed to their destinations by sophisticated electronic equipment. The size of the area served by each cell site is dependent on several factors, including the number of antennas used, the height at which the antennas are deployed, the topography of the land, vegetative cover and natural or man-made obstructions in the area. As customers move throughout the service area, the transmission from the portable devices is automatically transferred to the AT&T facility with the best connection to the device, without interruption in service provided that there is overlapping coverage from the cells.

¹ The threshold range differences between the 700 MHz and 1900 MHz frequency bands directly correlates to the type branch diversity receivers deployed in AT&T's receiver design.

In order to define the extent of the coverage gap to be filled once CT2216 is decommissioned, both propagation modeling and real-world drive testing has been conducted in the area of Milford. Propagation modeling uses PC software to determine the network coverage based on the specific technical parameters of each site including, but not limited to, location, ground elevation, antenna models, antenna heights, and also databases of terrain and ground cover in the area. Drive testing consists of traveling along area roadways in a vehicle equipped with a sophisticated setup of test devices and receivers that collect a variety of network performance metrics. The data are then processed and mapped in conjunction with the propagation modeling to determine the coverage gaps.

Analysis of the propagation modeling and drive testing in Milford reveal that AT&T's network will be unreliable once CT2216 is taken down due to gaps in coverage, and that there is a service deficiency as a result. In order to fill in these coverage gaps and improve the network reliability to Milford, a new facility is needed in the area.

Table 1 below approximates the current coverage gap of AT&T’s 700 MHz LTE technology in the vicinity of the proposed site.

	Coverage from Decommissioned Site	
Population: ²	(≥ -93 dBm)	3188
Business Pops: ³	(≥ -93 dBm)	5269
Area (mi²):	(≥ -93 dBm)	1.69
Roadway (mi):	Main (-93 dBm):	7.27
	Secondary (-93 dBm):	12.28
	Total (-93 dBm):	19.55

Table 1: Coverage from Decommissioned Site

² Population figures are based upon 2010 US Census Block Data

³ Employee population counts are based upon the 2011 U.S. Census Bureau LEHD database.

Included with this report are Attachments 1-7, which are explained below to help describe AT&T's network in and around Milford, and the need for the proposed facility.

- Attachment 1: “*CT2327 Area Terrain Map*” details the terrain features around the area of deficient service being targeted by the proposed site in Milford. These terrain features play a key role in determining site designs and dictating the unique coverage achieved from a given location. This map is included to provide a visual representation of the ridges and valleys that must be considered when siting a wireless facility. The green and blue shades correspond to lower elevations, whereas the orange, red and white shades indicate higher elevations.
- Attachment 2: “*Neighbor Site Data*” provides site specific information of existing neighboring sites used to perform the coverage analysis provided in Attachments 4 - 6.
- Attachment 3: *Map of Distance to Neighbor Sites – Milford* provides an overview of AT&T's network of sites in the area, with distances shown from the proposed CT2327 site to the existing sites in the surrounding area.
- Attachment 4: “*Existing 700 MHz LTE Coverage*” for the Current AT&T Network depicts 700 MHz LTE coverage from existing sites. The coverage shown is where the signal strengths are: > -83 dBm (minimum level required reliable, high quality service and performance at 700 MHz) and, > -93 dBm (minimum required for adequate level of service at 700 MHz).
- Attachment 5: “*700 MHz LTE Coverage without CT2216 Site*” shows how decommissioning this site would create a significant coverage gap for this area of Milford.
- Attachment 6: “*700 MHz LTE Coverage with CT2327 Site*” shows the composite coverage from the proposed facility when integrated into the network. Table 2 provides the details of this fill-in coverage.
- Attachment 7: *Connecticut DOT Average Annual Daily Traffic Data – Milford* shows the available vehicular traffic volume data for the subject area from the Connecticut Department of Transportation. This data shows as many as 35,000 vehicles per day passing through Boston Post Road just north of the proposed site.

Table 2 below lists the coverage statistics compiled for the AT&T's 700 MHz LTE network with the proposed deployment of the proposed permanent facility at an antenna centerline of 100 feet.

	Coverage Recovered with Proposed Site	
Population: ⁴	(≥ -93 dBm)	3188
Business Pops: ⁵	(≥ -93 dBm)	5269
Area (mi²):	(≥ -93 dBm)	1.69
Roadway (mi):	Main (-93 dBm):	6.66
	Secondary (-93 dBm):	11.95
	Total (-93 dBm):	18.61

Table 2: Coverage Recovered by Proposed Site

⁴ Population figures are based upon 2010 US Census Block Data

⁵ Employee population counts are based upon the 2011 U.S. Census Bureau LEHD database.

4. Conclusion

AT&T has identified an area of deficient coverage affecting a significant portion of Milford, CT, including key traffic corridors through the residential areas of the town. The proposed Milford permanent facility will bring the needed fill-in coverage to significant portions of Route 1 (Boston Post Road), New Haven Road, Cherry Street and the residential neighborhoods in the vicinity of these roads, all of which will be impacted by the decommissioning of AT&T's existing site CT2216.

No existing structures were identified and available that would be able to satisfy the coverage requirements needed for this area.

As discussed in this report and depicted in the attached plots, the proposed permanent AT&T site will provide a substantial portion of the coverage being lost in this area and maintain effective connectivity to the rest of AT&T's existing network.

5. Statement of Certification

I certify to the best of my knowledge that the statements in this report are true and accurate.

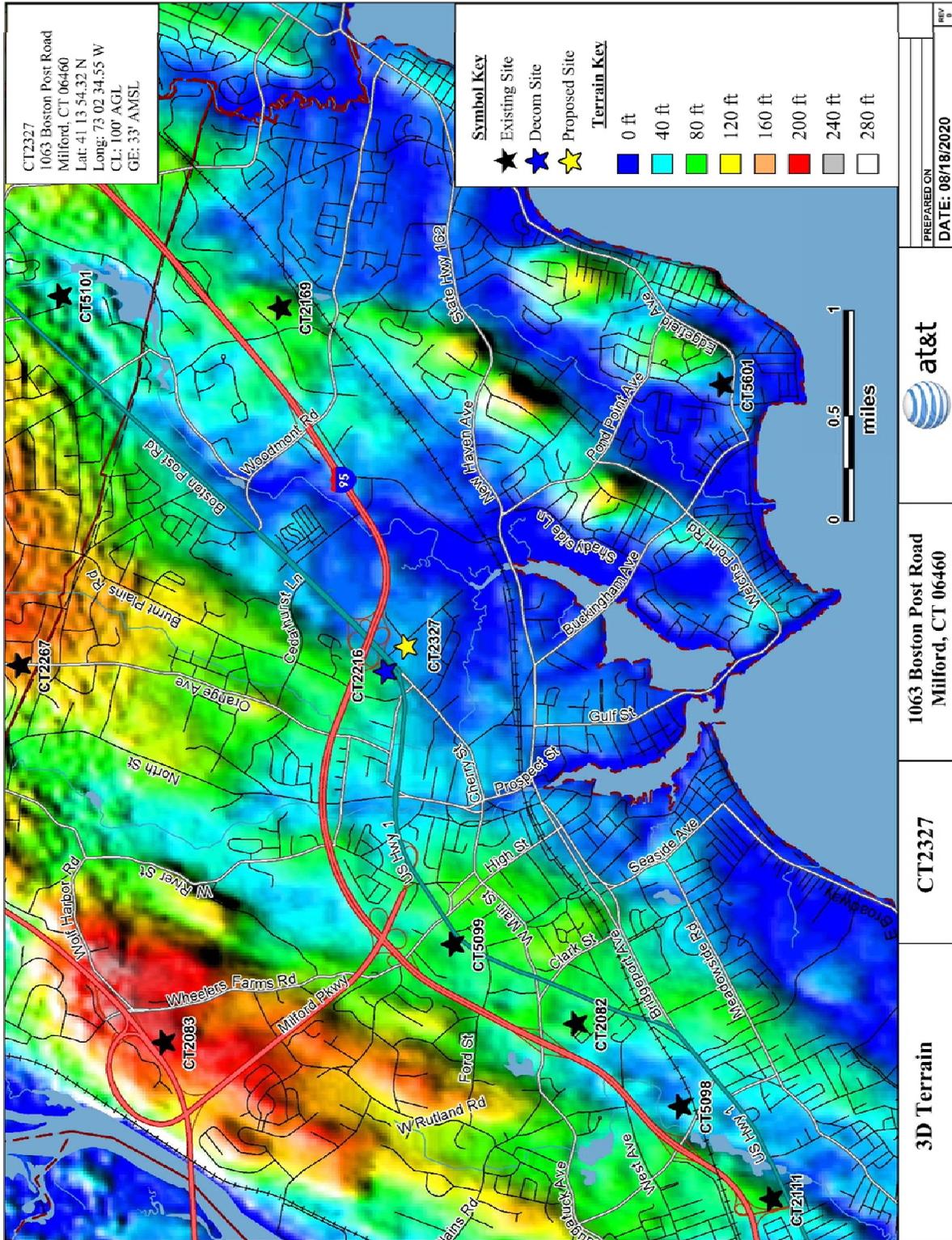


Martin J. Lavin
C Squared Systems, LLC

August 21, 2020

Date

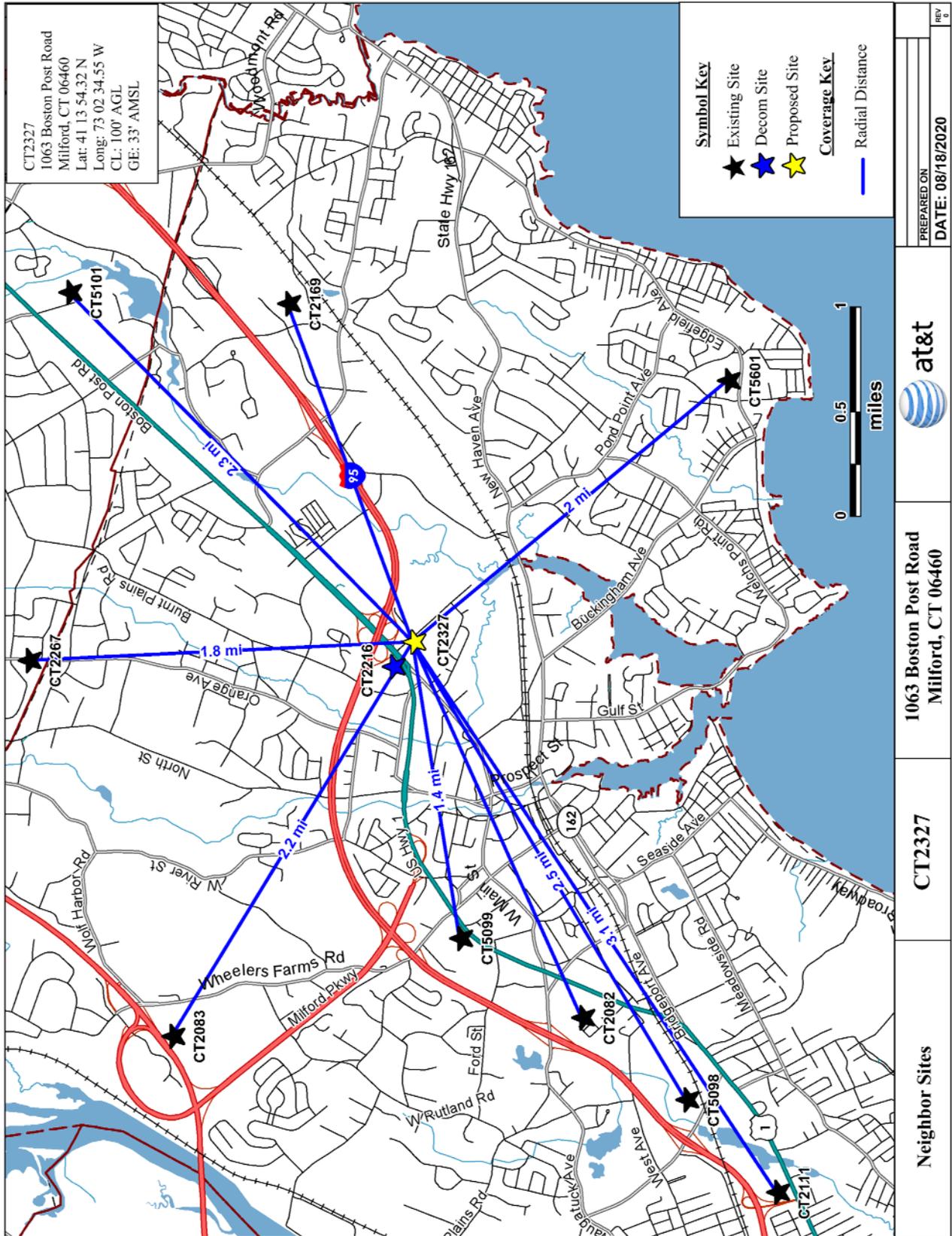
6. Attachments



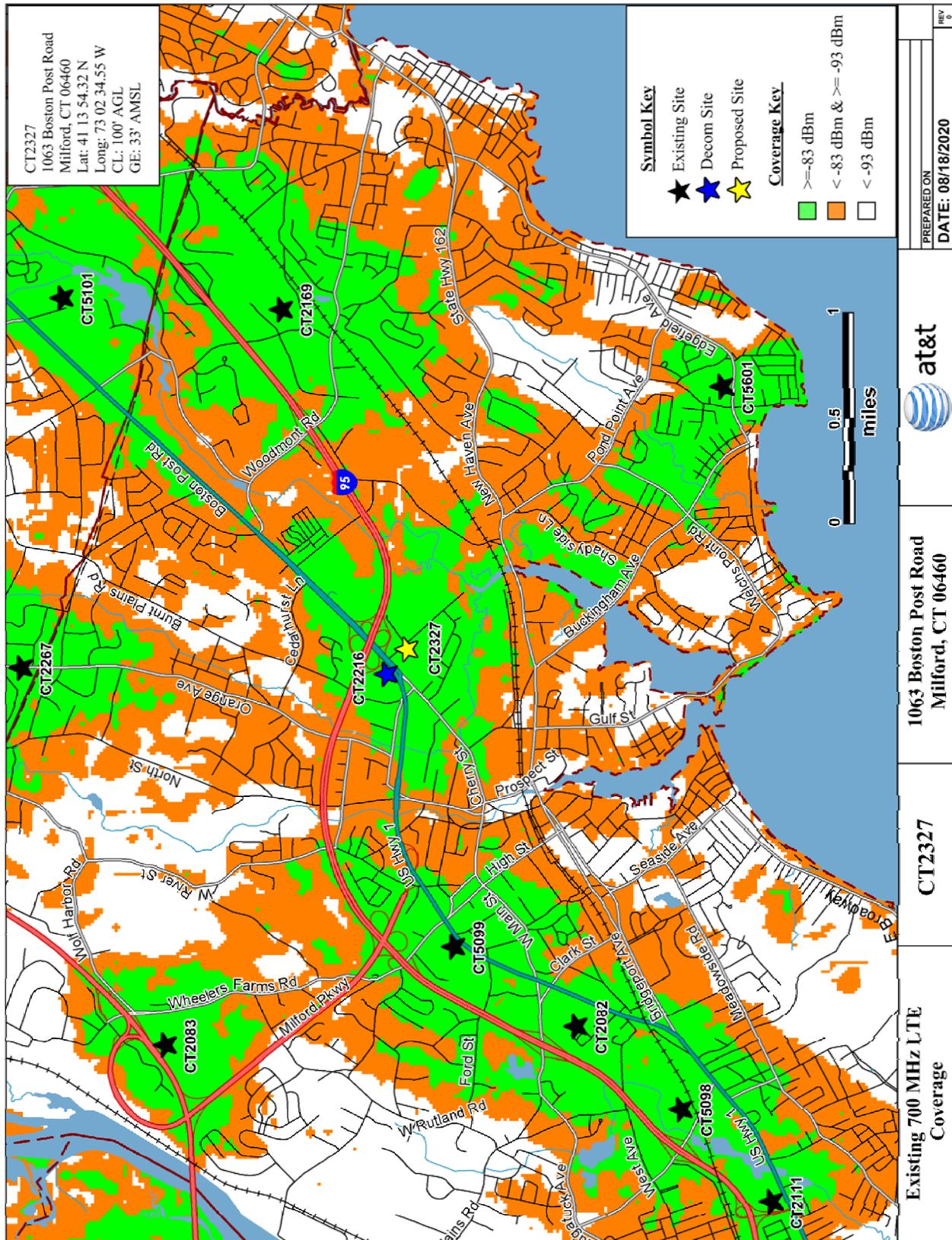
Attachment 1: CT2327 Area Terrain Map

Site Name	Address	City, State	Location		Antenna Height (ft AGL)	Structure Type	Status
			Latitude	Longitude			
CT2082	Bona Street	Milford, CT	41.22	-73.0773	136	Monopole	On-Air
CT2083	528 Wheelers Farm Road	Milford, CT	41.2484	-73.079	98	Monopole	On-Air
CT2111	438 Bridgeport Avenue	Milford, CT	41.2066	-73.0933	103	Monopole	On-Air
CT2169	203 Research Drive	Milford, CT	41.2404	-73.0119	167	Monopole	On-Air
CT2216	1052 Boston Post Road	Milford, CT	41.2332	-73.0452	58	Rooftop	On-Air, to Be Decommissioned
CT2267	298 Ridge Road	Orange, CT	41.2584	-73.0442	111	Utility	On-Air
CT5098	111 School House Road	Milford, CT	41.2128	-73.0848	125	Monopole	On-Air
CT5099	434 Boston Post Road	Milford, CT	41.2285	-73.0701	141	Self-Support	On-Air
CT5101	617 South Orange Center Road	Orange, CT	41.2555	-73.0108	182	Monopole	On-Air
CT5601	234 Melba Street	Milford, CT	41.21	-73.019	105	Stealth	On-Air
CT2327	1063 Boston Post Road	Milford, CT	41.2317	-73.0429	100	Monopole	Proposed

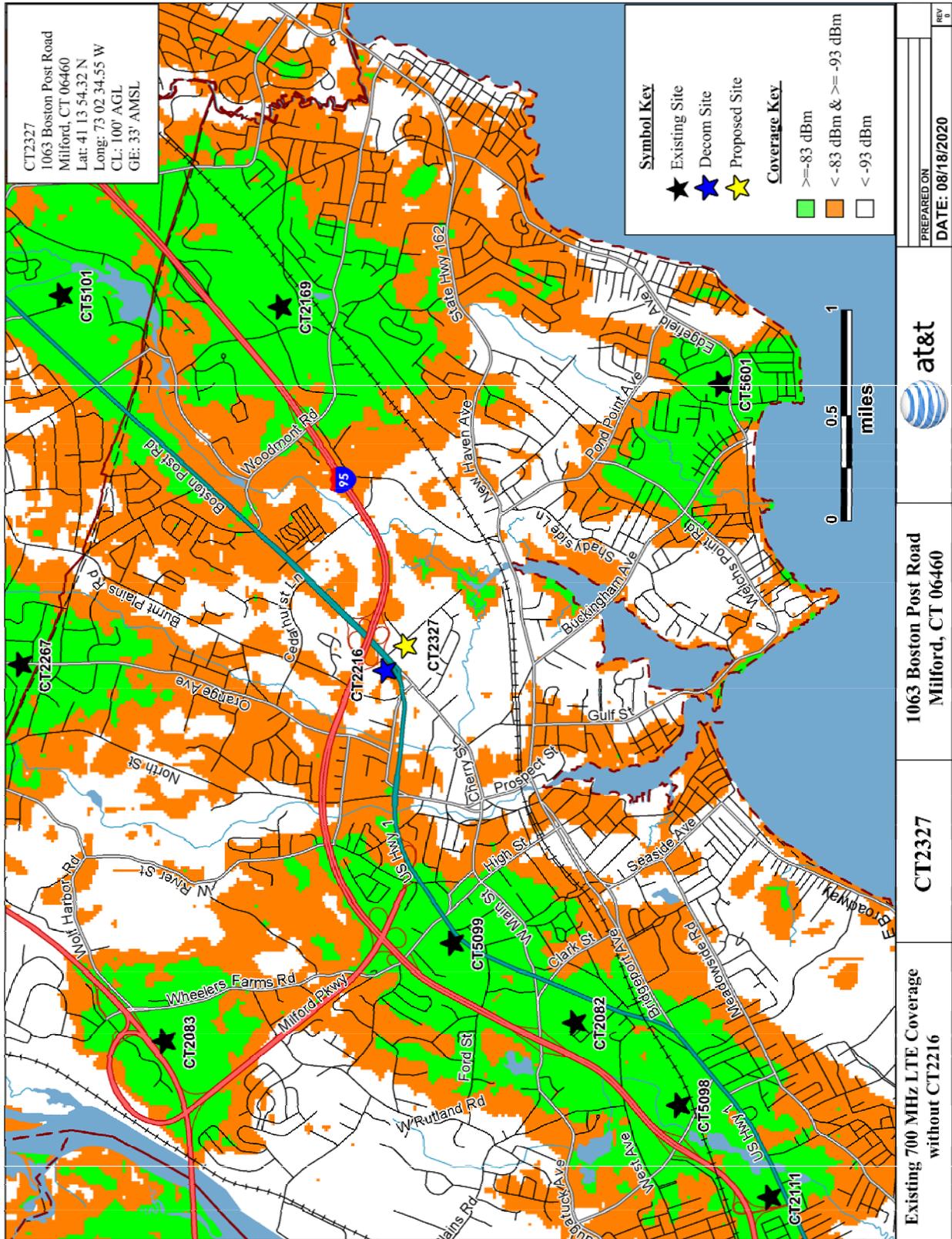
Attachment 2: CT2327 Neighbor Site Data



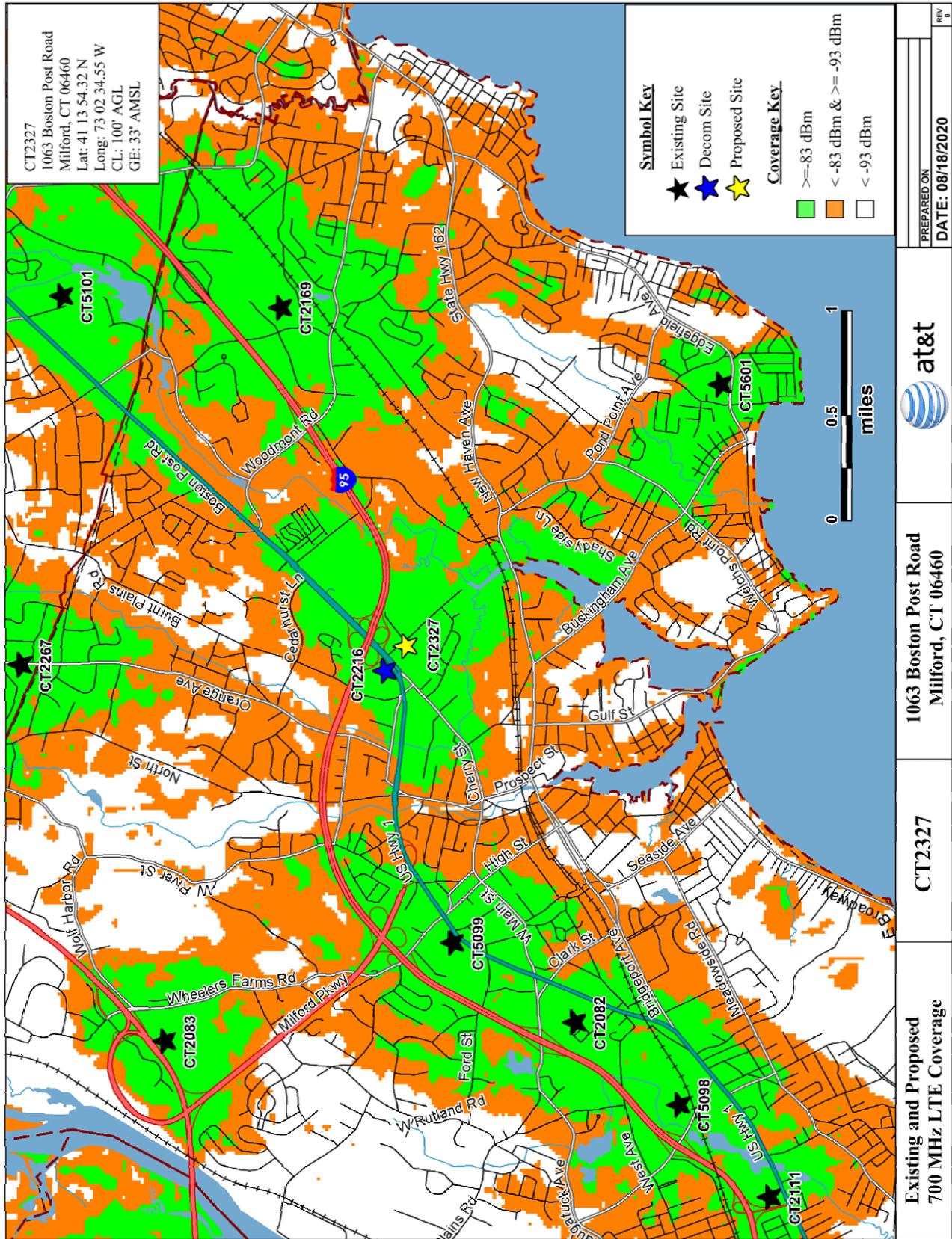
Attachment 3: CT2327 Neighbor Sites Map



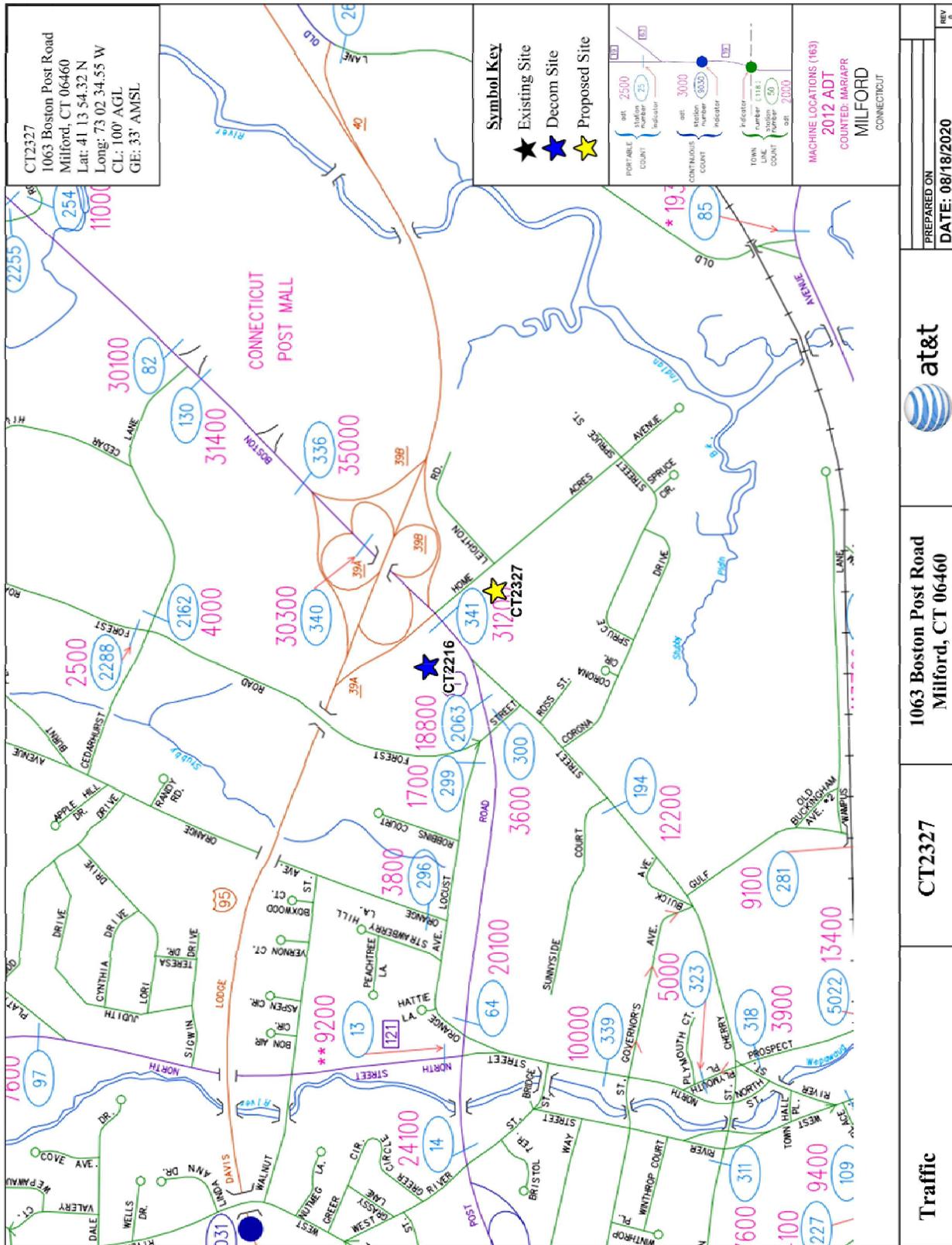
Attachment 4: CT2327 Existing 700 MHz LTE Coverage for Current AT&T Network



Attachment 5: CT2327 Existing 700 MHz LTE Coverage without CT2216 (Decommissioned)

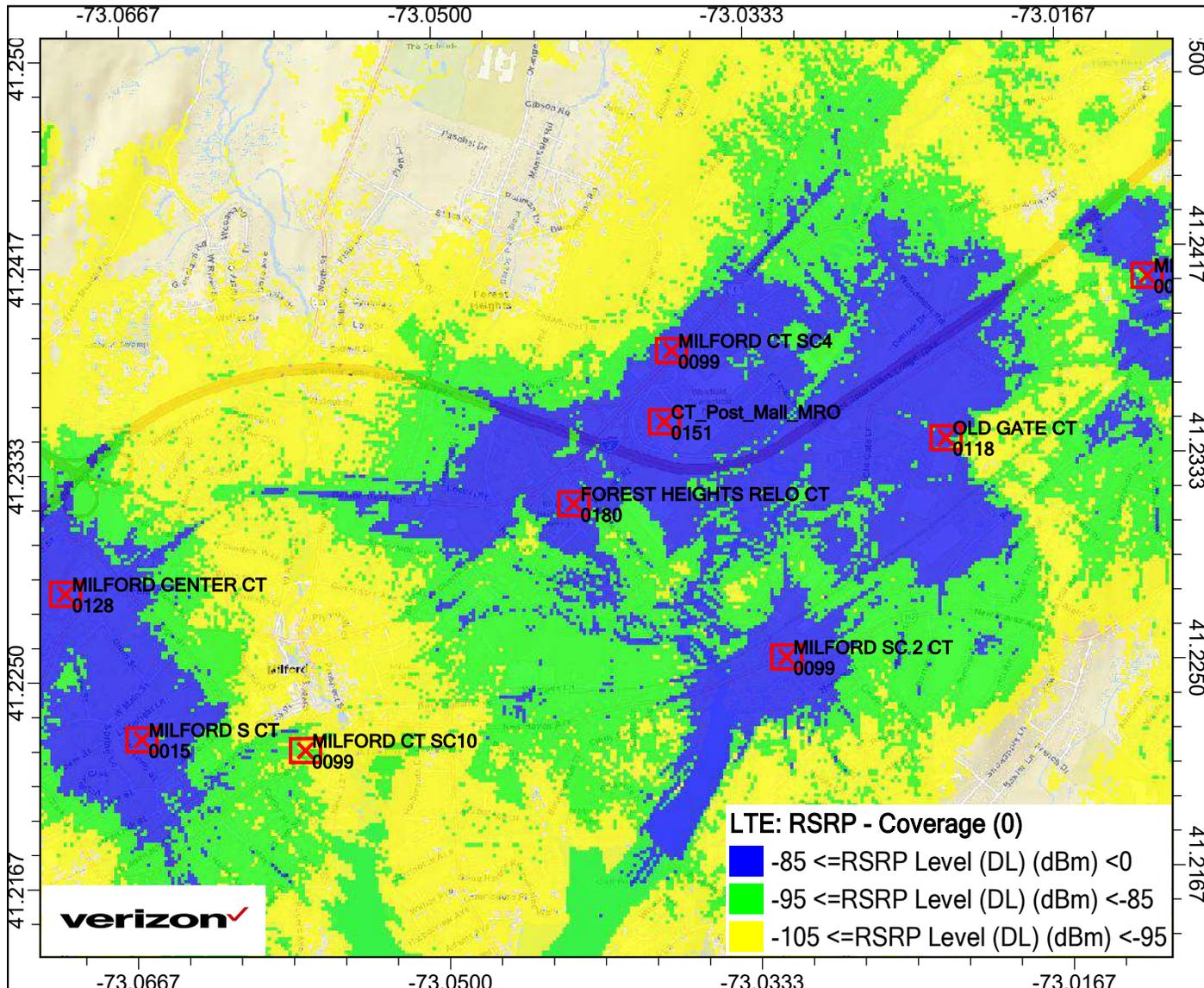


Attachment 6: CT2327 Existing 700 MHz LTE Coverage with Proposed Site

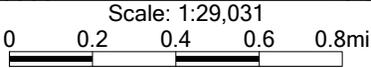
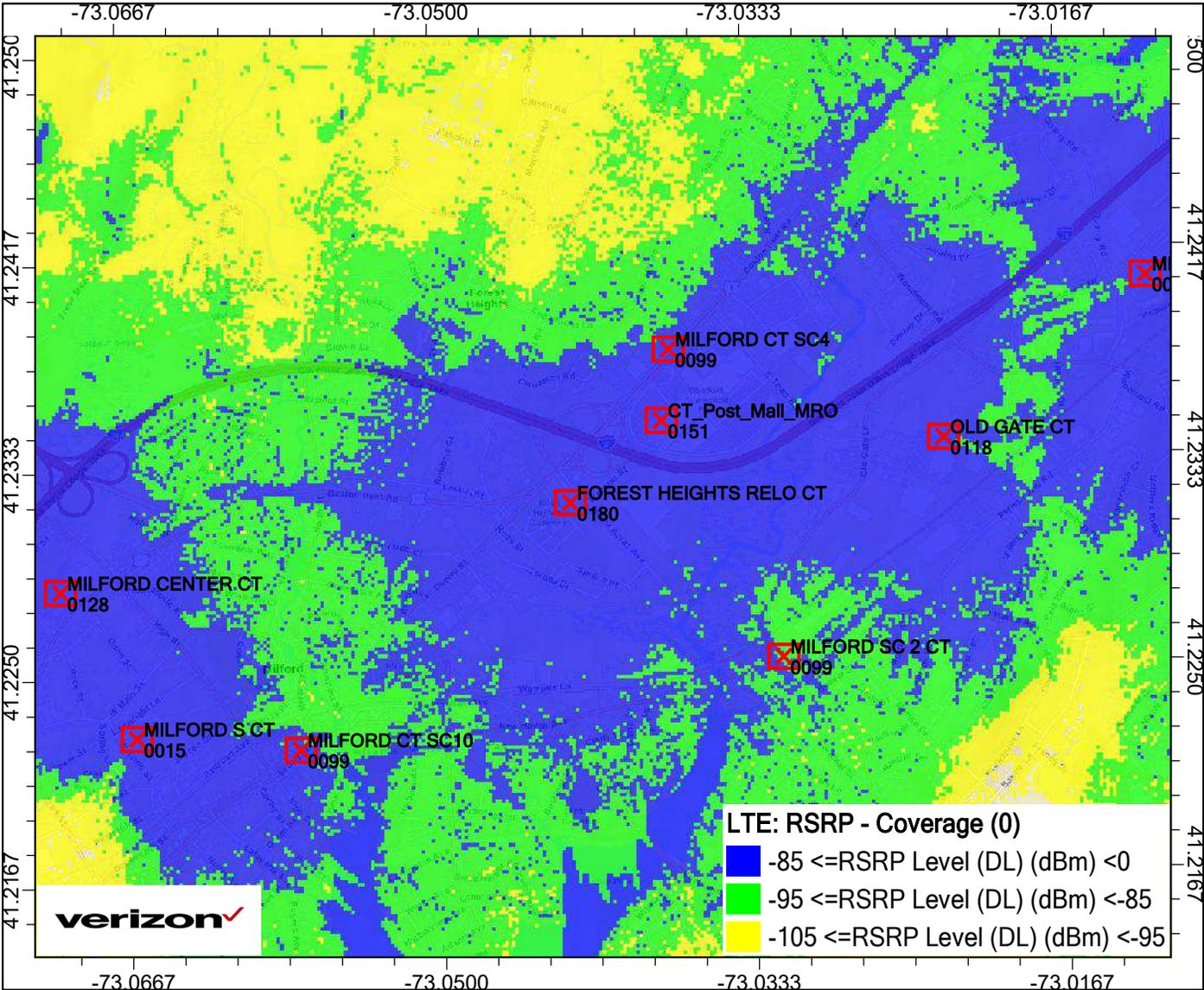


Attachment 7: Connecticut DOT Average Annual Daily Traffic Data – Milford

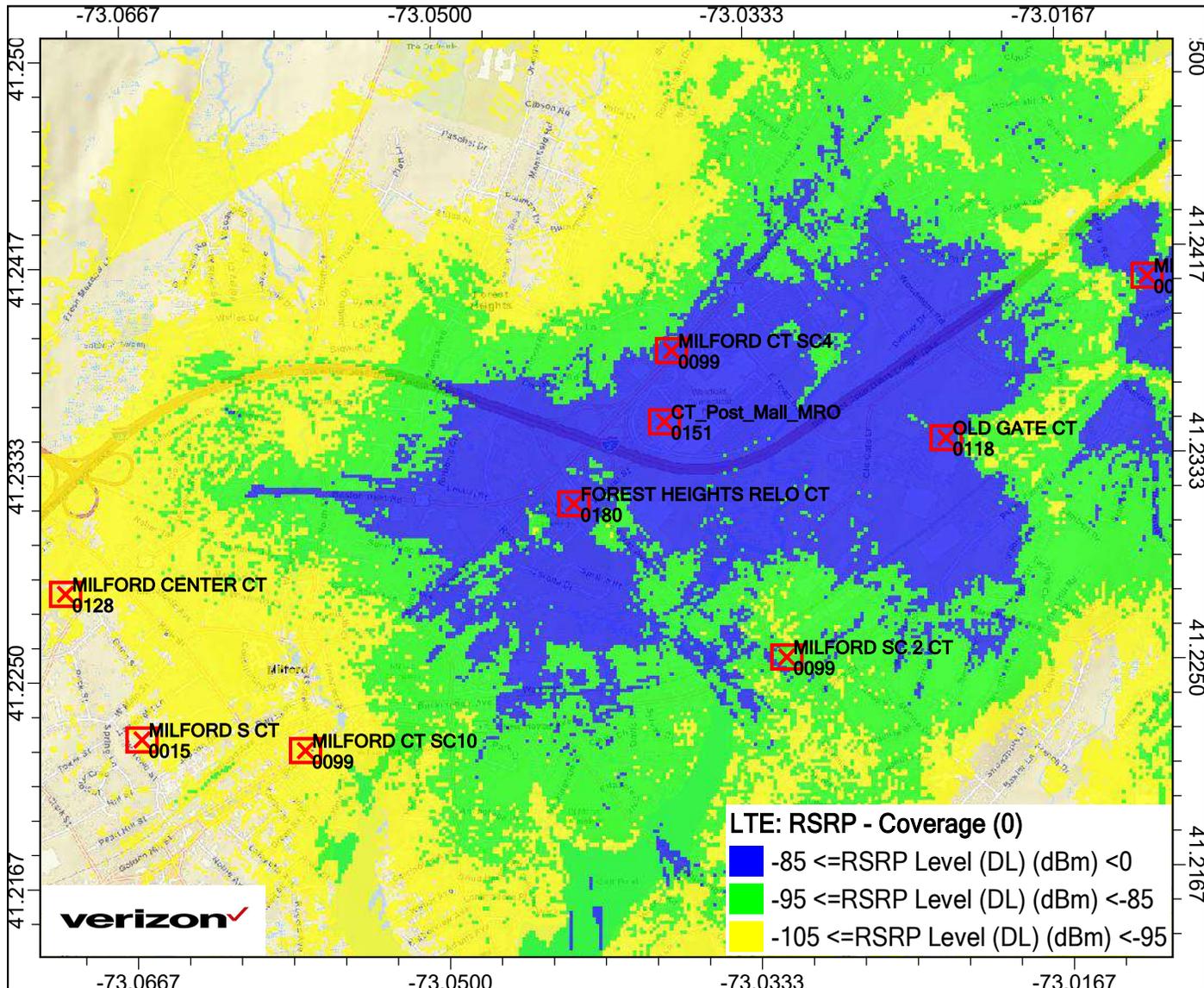
Composite, AWS 110'



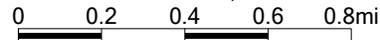
Composite, 700 MHz 110'



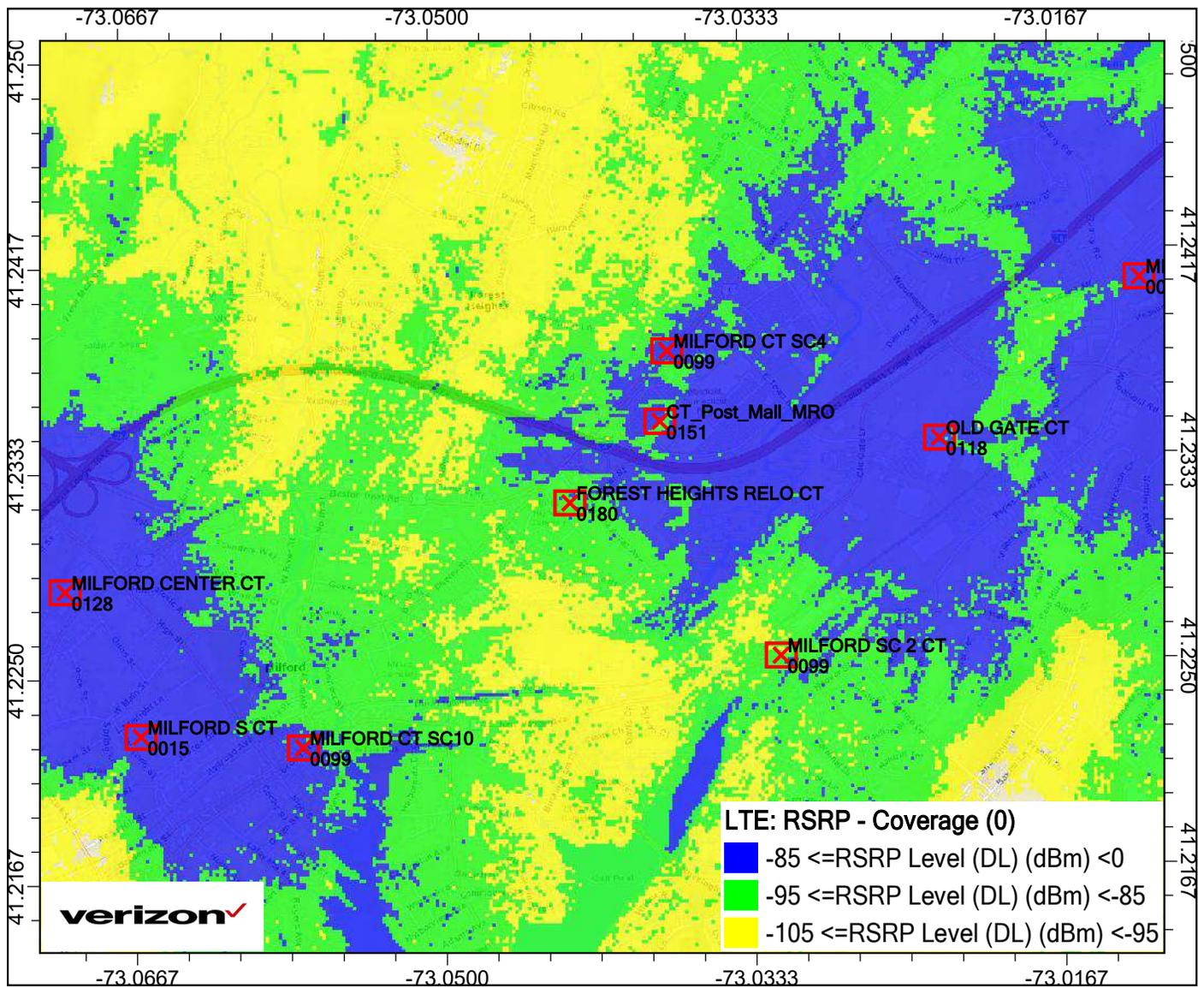
Composite, PCS 110'



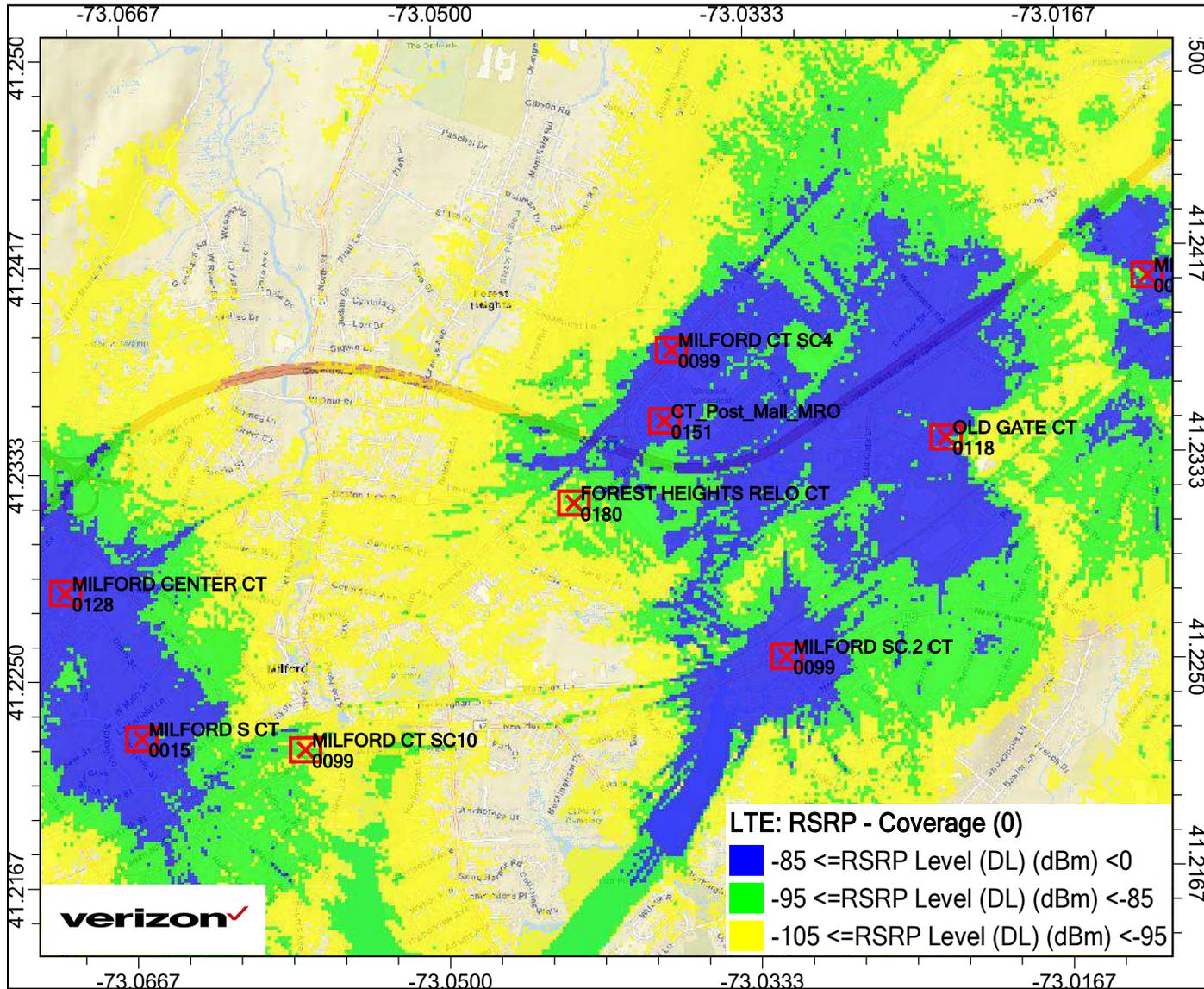
Scale: 1:29,031



W/O Forest Heights, 700 MHz



W/O Forest Heights, AWS



LTE: RSRP - Coverage (0)

-85 <=RSRP Level (DL) (dBm) <0

-95 <=RSRP Level (DL) (dBm) <-85

-105 <=RSRP Level (DL) (dBm) <-95

Scale: 1:29,031

0 0.2 0.4 0.6 0.8mi

W/O Forest Heights, PCS

